

# Engineering Data

## Stromberg-Carlson No. 245 Radio Receivers

**STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY**  
Rochester, New York

## ELECTRICAL SPECIFICATIONS

Type of Circuit	Superheterodyne with A. F. C. Electric Tuning	
Tuning Ranges	A—530 to 1700 Kc.; B—1700 to 5600 Kc.; C—5600 to 18,000 Kc.	
Number and Type of Tubes	{ 1 No. 6K7, 1 No. 6A8, 1 No. 6J5, 1 No. 6B8, 1 No. 6H6, 1 No. 6F5, 1 No. 6C5, 2 No. 6F6, 1 No. 6U5, 1 No. 5U4G	
Voltage Rating	105 to 125 Volts, A. C.	
Power Frequency Rating	25 to 60 Cycles and 50 to 60 Cycles	
Input Power Rating:		
Radio Models Only	130 Watts	
Radio-Phono. Models	165 Watts	
Frequency of Intermediate Amplifier	465 Kilocycles	

## APPARATUS SPECIFICATIONS

No. 245-L	50 to 60 Cycles; P-28481 Chassis; P-27385 Loud Speaker
No. 245-LB	25 to 60 Cycles; P-28482 Chassis; P-27385 Loud Speaker
No. 245-M	50 to 60 Cycles; P-28481 Chassis; P-27504 Loud Speaker
No. 245-MB	25 to 60 Cycles; P-28482 Chassis; P-27504 Loud Speaker
No. 245-R	50 to 60 Cycles; P-28481 Chassis; P-27385 Loud Speaker
No. 245-RB	25 to 60 Cycles; P-28482 Chassis; P-27385 Loud Speaker
No. 245-P	60 Cycles Only; P-28590 Chassis; P-27504 Loud Speaker; P-27839 Phono. Motor Unit
No. 245-PB	25 Cycles Only; P-28591 Chassis; P-27504 Loud Speaker; P-27840 Phono. Motor Unit

## CIRCUIT DESCRIPTION

The Stromberg-Carlson No. 245 Radio Receivers are eleven tube, "Electric Tuning", adjustable high fidelity receivers and have three tuning ranges. Either "Manual" or "Electric" tuning is easily obtainable by simply rotating the "Manual-Electric" tuning control knob to the desired position; when the Manual-Electric tuning control knob is set so that the arrow on the knob points in the direction of the word "Manual", the tuning dial of the receiver is illuminated and when the arrow on this control knob points in the direction of the word "Electric" the call letters of the six stations which are set-up for electric tuning become illuminated; also, when electric tuning is in use, automatic frequency control is employed. When it is desired to tune in stations located in either the Medium Wave or Short-Wave ranges, the electric tuning arrangement is made inoperative. The electric tuning circuit is arranged so that six favorite stations located in the Standard Broadcast range may be set-up for selection by means of the push-buttons. (Local and other stations that give the best daytime

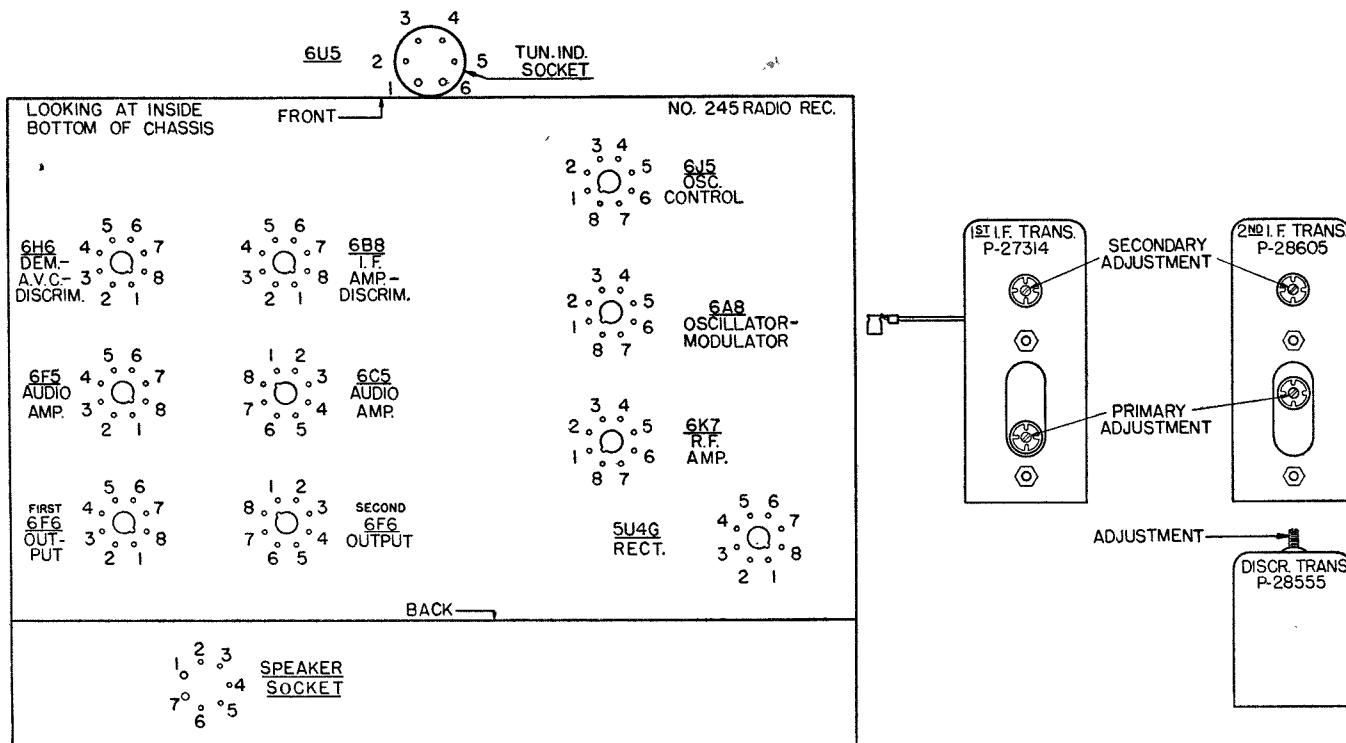


Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the Aligning Adjustments for the I. F. and Discriminator Circuits.

**and evening service should be selected).** To properly set-up the electric tuning arrangement for the six favorite broadcast stations, read the section, "Instructions for Setting Up the Electric Tuning Arrangement" appearing on page 6 of this book. When manually tuning these receivers, or when setting up the six desired stations for electric tuning, resonance with a signal is indicated by means of the tuning indicator tube which operates on the cathode-ray principle. The strength of a received signal may be determined by observing the size of the aperture appearing on the target of the tuning indicator tube, the stronger a received signal the greater the reduction in the size of the aperture. In order to obtain maximum performance on the Standard Broadcast Range ("A" Range) of these receivers, a "signal admission control switch" is provided. This control is located on the inside rear flange of the chassis base, and has a slotted shaft which protrudes through the base so that it may be adjusted by the use of a screwdriver. When either the "B" or "C" ranges are in operation, this "signal admission control" is automatically cut out of the circuit, allowing the receiver to function at its maximum sensitivity on these two ranges. When operating in the Standard Broadcast Range, maximum sensitivity is obtained when the slotted shaft of this control is rotated to its maximum counter-clockwise position. To properly set this control, place the receiver in operation and then adjust this control so that clearest reception is obtained. The control should remain in this position. Do not readjust this control for each frequency. The above adjustment should be made in the evening if best results are to be obtained.

When reception conditions warrant, the fidelity of this receiver can be increased by rotating the "Tone-Fidelity" switch control knob in a clockwise rotation from the normal position of this control. High Fidelity reproduction is obtained in two steps from the normal position of this control. These receivers are also provided with a low level bass frequency compensating circuit in conjunction with the volume control circuit, so that balanced reproduction is obtained for any setting of the volume control. A metal guard frame is also furnished on these receivers to prevent damage to the chassis components and also to facilitate ease of servicing should this become necessary.

The various tubes are used in these receivers as follows: The No. 6K7 tube is used in the R. F. Amplifier. The No. 6A8 tube is used as both the Modulator and Oscillator tube. The No. 6J5 tube is used in the Oscillator Control Circuit for Automatic Frequency Control. The No. 6B8 tube is used in the I. F. Amplifier; in addition, one of the diodes in this tube is also used in the Discriminator section of the Automatic Frequency Control circuit. The No. 6H6 tube is used as the Demodulator and the Automatic Volume Control tube; also, in addition, one of the diodes in this tube is used in the Discriminator section of the Automatic Frequency Control circuit. The No. 6C5 tube is used as the Phase Inverter tube of the Audio Amplifier circuit. The No. 6F5 tube is used in the Audio Amplifier Stage (Driver). The two No. 6F6 tubes are used in the Audio Power Output Stage. The No. 5U4G tube is the Rectifier tube of the Power Supply Unit and the No. 6U5 tube is used for indicating the resonance in the Tuning Indicator System.

### NORMAL VOLTAGE READINGS

The various values of voltages listed in the following table are obtained by measuring between the various tube socket contacts and the chassis base, with the tubes in their respective sockets. The receiver is, therefore, in operation when the measurements are made. Figure 1, shows the terminal layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 120 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a resistance of 1000 ohms per volt should be used for measuring the D. C. voltages. Voltage values shown are those obtained on the lowest possible scale of a meter having the following ranges: 0-2.5, 0-10, 0-100, 0-250, 0-500, 0-1000 volts except when an asterisk appears after any given voltage value, in which case the 250 volt scale was used.

Tube	Circuit	Cap	Terminals of Sockets								Heater Voltages Between Heater Terminals	
			1	2	3	4	5	6	7	8	Socket Terminal Numbers	Volts
6K7	R. F. Amp.	0	0	0	+225	+107	0	0	6.1	0	2-7	6.1
6A8	Osc.—Mod.	0	0	0	+225	+107	-10	+130	6.1	0	2-7	6.1
6J5	Osc. Control	—	0	0	+170	+3.8	0	+225	6.1	+3.8	2-7	6.1
6B8	I. F. Amp.—Discriminator	0	0	0	+220	0	0	+107	6.1	0	2-7	6.1
6H6	Discriminator—Dem.—A. V. C.	—	0	0	0	0	0	0	6.1	0	2-7	6.1
6F5	Audio Amp.	0	0	0	0	+135	+110	+135	6.1	+1.3	2-7	6.1
6C5	Audio Amp. (Inv.)	—	0	0	+110	+110	0	+220	6.1	+5.2	2-7	6.1
1st 6F6	Audio Output	—	0	0	+300	+310	0	0	6.1	+22	2-7	6.1
2nd 6F6	Audio Output	—	0	0	+300	+310	0	0	6.1	+22	2-7	6.1
6U5	Tuning Indicator	—	6.1	+15*	0	+225	0	0	—	—	1-6	6.1
5U4G	Rectifier	—	0	+425	0	390	0	390	0	+425	2-8	4.8
Speaker Socket			—	+400	0	0	+425	+425	0	+310	—	—

A. C. voltages are indicated by italics. Receiver tuned to 1000 Kc., no signal.

## ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers, and ordinarily no readjustments are necessary. However, should it become necessary to make any readjustments, the procedure given in these instructions should be carefully followed. The preferred method of aligning these receivers is by the use of a suitable cathode ray oscilloscope and frequency modulator unit in conjunction with the standard signal generator.

To accurately align circuits in these receivers, it is necessary to use a high grade signal generator capable of being modulated 30% and having an output voltage of at least 100,000 microvolts; it will also be necessary to have this output voltage controlled so that only a few microvolts may be fed into the receiver. In conjunction with the signal generator, a sensitive output meter should be used for determining the maximum signal voltage developed across the voice coil of the loud speaker. In addition to this equipment, it will be necessary when making a final adjustment of the "Discriminator" tuned circuit to use a milliammeter having a range of 0 to 10 milliamperes connected in series with the cathode of the No. 6J5 oscillator control tube by means of an adaptor plug inserted between the tube and its socket. The leads to the meter should not be longer than 15", and should be shunted at the socket connections by a capacitor of not less than 0.25 Mfd.

In order to make the aligning adjustments in an easy and satisfactory manner, it is recommended that the Stromberg-Carlson P-27657 and P-27658 aligning tools be used.

Before proceeding with the alignment of any circuits in these receivers, except when specifically directed, be sure that the "Signal Admission Control" is set for the maximum sensitivity position, that the Fidelity Control knob is set for the "Normal" position and that the "Manual-Electric" control knob is set to the "Off" position. The "Off-On-Bass" control should also be set for the "Normal" position. In making any alignment adjustments always adjust the test oscillator's output voltage to the minimum value where a good alignment may still be obtained, except when specifically directed in these instructions. Figures Nos. 1 and 2, show the location of all the aligning capacitors or adjustments for this receiver. It will not be necessary to remove the chassis in this receiver from its cabinet in order to make any alignment adjustments. The alignment adjustments for the Intermediate Frequency circuits are accessible from the rear of the receiver, and the adjustments for the Radio Frequency circuits are accessible through the apertures located in the bottom metal base plate of the chassis. These apertures are easily accessible through the bottom of the cabinet shelf. Never align any of these receivers without having the metal base plate fastened to the chassis base.

### Dial Adjustment

Before aligning the circuits of these receivers, the tuning dial must be properly aligned to "track" with the gang tuning capacitor. To check whether the dial is set correctly with respect to the gang tuning capacitor, rotate the "Rapid Station Selector" knob in a clockwise direction so that the gang tuning capacitor is set to its maximum capacity position. Then, with the receiver turned "on", the illuminated dial indicator line should be exactly centered over the dial alignment lines (black lines) which are located at the extreme low frequency end of each scale on the dial. If these lines do not center over the illuminated dial indicator line, loosen the two set screws located on the hub of the dial. Then, rotate the dial so that these alignment lines are centered over the illuminated dial indicator line. The two set screws of the dial hub should then be securely tightened.

### Intermediate Frequency Adjustments

The intermediate frequency used in these receivers is 465 kilocycles. Because of the necessity of obtaining the proper shape of resonance curve of these stages in a high fidelity receiver, it is recommended that unless it is absolutely essential, these I. F. adjustments be untouched. In the factory these adjustments are made using a visual system which allows the operator to see the exact shape of the resonance curve. For this reason

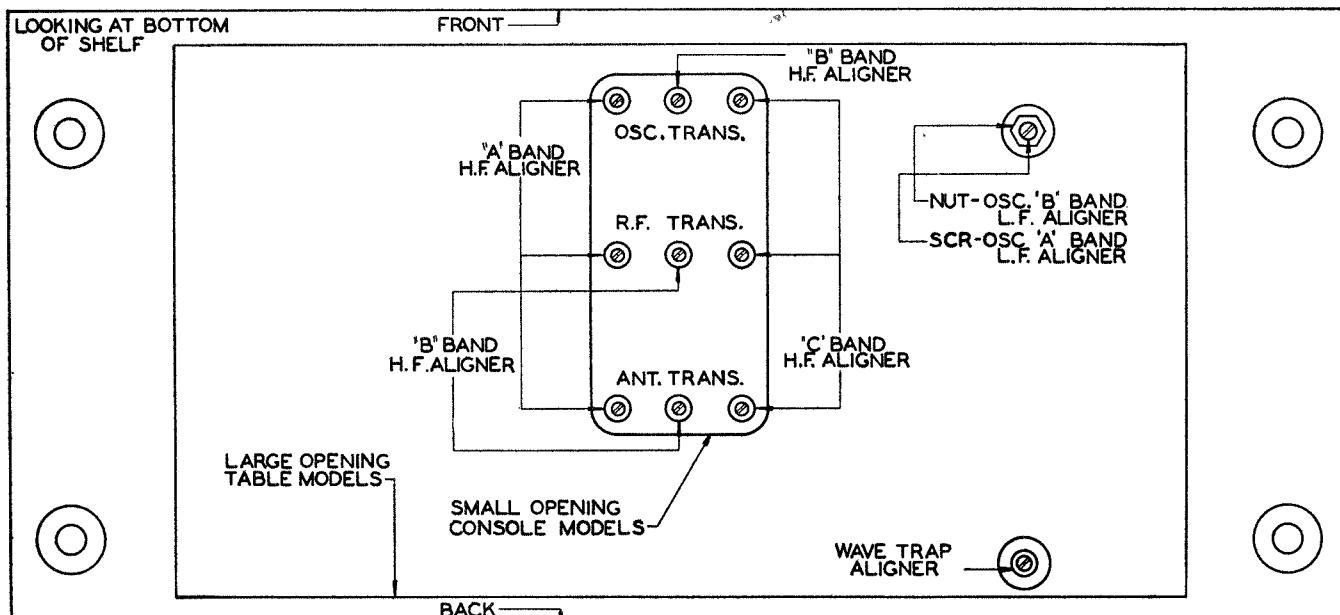


Fig. 2. View Through Chassis Mounting Shelf Showing Adjusting Screws for R. F. Aligning Capacitors.

it is best to have these adjustments made at the factory. However, in the case where this cannot be done, the following procedure should be followed.

1. Operate the Range Switch of the receiver to the Standard Broadcast range position and set the tuning dial to its extreme low frequency position. Set the Fidelity control knob to its "Normal" position, the "Manual-Electric" control knob to the "Manual" position, and the "Off-On-Bass" control knob to its normal position.

**CAUTION:** Never attempt to align the R. F. or I. F. circuits of this receiver with the Fidelity control knob set at any position other than the "Normal" position and the "Manual-Electric" control knob set at the "Electric" position unless specifically directed in the following paragraphs. Also, do not make any aligning adjustments of the R. F., I. F., or "Discriminator" circuits with the A. F. C. switch (which is located on rear of the chassis base) set at the "set-up" position. See Fig. 5.

2. Apply between the chassis base (or ground binding post) of the receiver and the grid of the No. 6A8 modulator-oscillator tube, a modulated signal of 465 kilocycles from the signal generator, using a 0.1 mfd. capacitor in series with the connection between the output terminal of the signal generator and the grid of the No. 6A8 tube. Do not remove the chassis grid lead connecting to this tube. The ground (or low side) terminal of the signal generator should be connected to either the chassis base or the ground binding post.
3. Now, noting from Fig. 1, the alignment adjustments for the First and Second I. F. transformers, align the I. F. circuits in the following order:

Adjust the Second I. F. transformer primary circuit for maximum output.

Adjust the Second I. F. transformer secondary circuit for maximum output.

Adjust the First I. F. transformer primary circuit for maximum output.

Adjust the First I. F. transformer secondary circuit for maximum output.

Carefully make all of the above adjustments, watching carefully the output meter so that the peak reading is obtained for each adjustment. As each adjustment is made reduce the output of the test oscillator as required.

4. To adjust the Discriminator circuit proceed as follows:

Check the position of the "Manual-Electric" control knob which should be set to the "Manual" position. **CAUTION:** Before adjusting this circuit be sure that the I. F. amplifier is tuned exactly to 465 kilocycles. With the signal generator still set at a frequency of 465 kilocycles, adjust the signal generator's output control so that a signal of 50,000 to 100,000 microvolts is fed into the No. 6A8 modulator-oscillator tube. Now, observe the reading of the milliammeter which is connected in series with the cathode of the No. 6J5 oscillator control tube, and rotate the "Manual-Electric" control knob to the "Electric" position, observing whether there is any difference in the reading of the milliammeter. When this circuit is correctly adjusted, there should be no difference in the reading of the milliammeter when the "Manual-Electric" control knob is rotated from the "Manual" to the "Electric" position. If there is any difference in the milliammeter reading while rotating this control knob from the "Manual" to the "Electric" position and vice versa, adjust the "Discriminator" circuit by means of the screw adjustment located on the top of the Discriminator transformer until the meter reading has the same value regardless of whether the "Manual-Electric" control knob is rotated to the "Manual" or "Electric" position. When this condition is obtained, the Discriminator circuit is properly adjusted.

## Radio Frequency Adjustments

The alignment of the radio frequency circuits in these receivers should be very carefully made and in the order specified.

When making any aligning adjustments of these circuits, the "Manual-Electric" control knob should be rotated to the "Manual" position, the Fidelity Control knob should be set for "Normal" operation, and the "Off-On-Bass" control knob should also be set for "Normal" operation.

### Alignment of Short Wave Range (Also Referred to as "C" Band)

In aligning the radio frequency circuits for this range, replace the 0.1-microfarad capacitor which was placed in series with the test oscillator's output lead for the I. F. alignments, with a 400-ohm carbon type resistor. This lead should then be connected to the antenna binding post located on the rear of the receiver chassis. The ground terminal (or low side) of the test oscillator should be connected to the ground binding post on the receiver.

1. Operate the Range Switch on the receiver chassis to the "C" range position, and set the test oscillator's frequency and the receiver's tuning dial to 16 megacycles.
2. Adjust the oscillator's "C" band high frequency aligner for maximum output.
3. Adjust the R. F. interstage "C" band high frequency aligner for maximum output and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.
4. Adjust the antenna's "C" band high frequency aligner for maximum output, at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.

### Alignment of Medium Wave Range (Also Referred to as "B" Band)

In aligning the radio frequency circuits for this range, use the same artificial antenna (400-ohm carbon type resistor) in series with the output terminal of the test oscillator as was used for aligning the short-wave range.

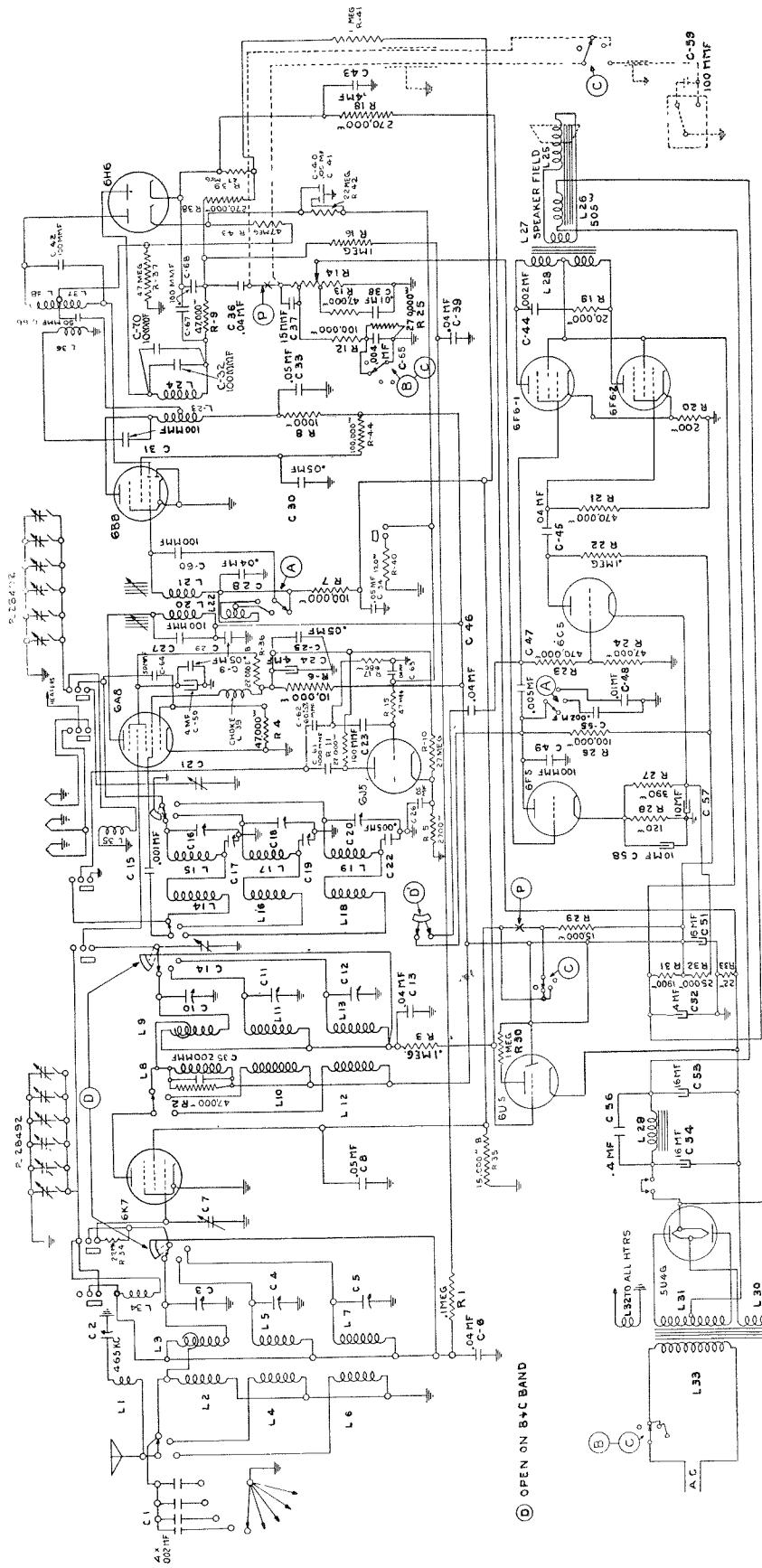


Fig. 3. Schematic Circuit of Receiver.

1. Operate the Range Switch on the receiver chassis to the "B" range position, and set the test oscillator's frequency and the receiver's tuning dial to 5 megacycles.
2. Adjust the oscillator's "B" band high frequency aligner for maximum output.
3. Adjust the R. F. interstage "B" band high frequency aligner for maximum output and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.
4. Adjust the antenna's "B" band high frequency aligner for maximum output, and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.
5. Set the test oscillator's frequency and the receiver's tuning dial to 1.8 megacycles.
6. Adjust the oscillator's "B" band low frequency aligner (series aligner), and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.
7. Reset both the test oscillator's frequency and the receiver's tuning dial to 5 megacycles and repeat operations Nos. 2, 3 and 4.

#### Alignment of Standard Broadcast Range (Also Referred to as "A" Band)

In aligning the radio frequency circuits for this range, replace the 400-ohm carbon type resistor in series with the test oscillator's output lead with a 200-micro-microfarad capacitor and align these circuits as follows:

1. Operate the Range Switch to the "A" range position and set the test oscillator's frequency and the receiver's tuning dial to 1.5 megacycles.
2. Adjust the oscillator's "A" band high frequency aligner for maximum output.
3. Adjust the R. F. interstage "A" band high frequency aligner for maximum output.
4. Adjust the antenna's "A" band high frequency aligner for maximum output.
5. Set the test oscillator's frequency and the receiver's tuning dial to 0.6 megacycles.
6. Adjust the oscillator's "A" band low frequency aligner (series aligner) for maximum output, and at the same time rotate the gang tuning capacitor slightly back and forth through resonance until maximum output is obtained.
7. Reset both the test oscillator's frequency and receiver's tuning dial to 1.5 megacycles and repeat operations Nos. 2, 3 and 4.

#### Wave Trap Adjustment

In adjusting the wave trap circuit, the "Signal Admission Control" should be set for the most sensitive position (shaft rotated in the most counter-clockwise direction). Set the Range Switch of the receiver to the "A" range position, the tuning dial to 1000 kilocycles, and the "Manual-Electric" control knob to the "Manual" position. Connect a 200-micro-microfarad capacitor in series with the output terminal of the modulated test oscillator and the antenna binding post on the receiver, and the ground terminal of the test oscillator to the ground binding post on the receiver. Then, with the modulated test oscillator set at the frequency of the intermediate amplifier, 465 kilocycles, supply a fairly strong signal to the receiver and adjust the wave trap aligner until a minimum indication is obtained on the output meter.

### PROCEDURE FOR OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS

In order to obtain reproduction of phonograph records in conjunction with any No. 245 Receiver, with the exception of the No. 245-P Receivers which are fully equipped for playing phonograph records, the following instructions should be followed.

A socket having three contacts is provided on the rear of the chassis base of these receivers. See Fig. 5. To equip these receivers for phonograph operation, it will be necessary to purchase and install in the receiver a Stromberg-Carlson, P-27946 Switch Assembly. Part of this assembly has to be wired to the above mentioned three prong socket. Complete instructions on how to install and operate this switch are furnished with each switch.

To obtain the best quality of phonograph reproduction when using an electric pick-up and phonograph unit with this receiver, a Stromberg-Carlson No. 10 Record Player is recommended. This record player is equipped with a correctly designed single record playing motor unit, and uses a crystal type pick-up in conjunction with a specially equalized circuit.

If the Stromberg-Carlson No. 10 Record Player is not used and the electric pick-up to be used is of the high impedance type, it will be necessary to connect a low capacity shielded cable between the three-prong socket furnished with the receiver and the pick-up. This shielded cable should be of the low capacity type, in order to prevent the excessive cutting of high frequencies which is caused when a shielded cable having high capacity is used. The length of the shielded cable used should be kept as short as possible.

If a pick-up of the low impedance type is used, it will be necessary to connect a "matching transformer" between the three-prong socket and the electric pick-up. The transformer should be located as near to the receiver as possible in which case it will not be necessary to use a shielded cable.

### INSTRUCTIONS FOR SETTING UP ELECTRIC TUNING ARRANGEMENT

1. Before proceeding to set-up the stations for electric tuning, the radio receiver should be turned "on" for approximately twenty to thirty minutes.
2. Check the position of the "Tone-Fidelity" switch control knob. When tuning in a signal this control knob

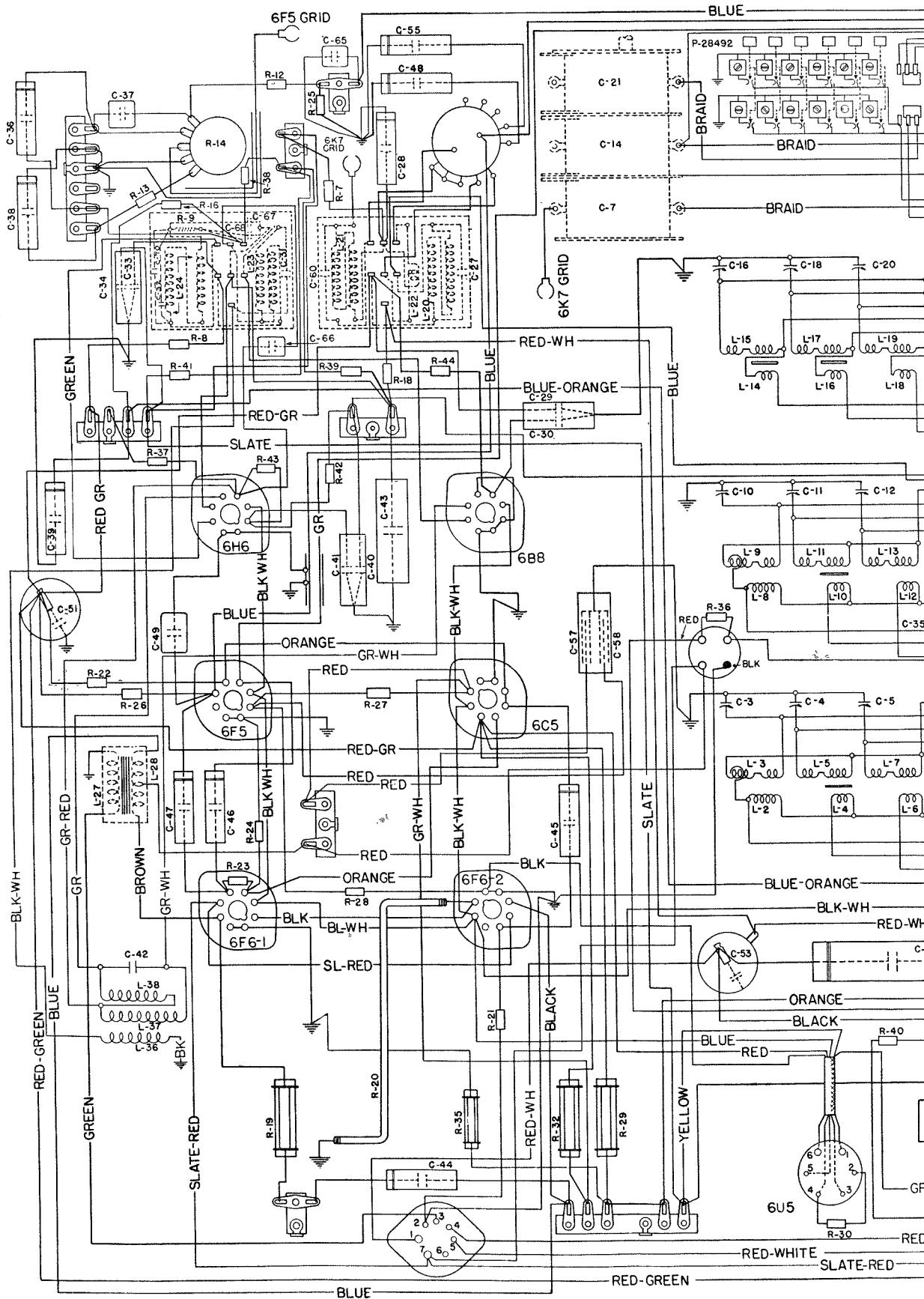
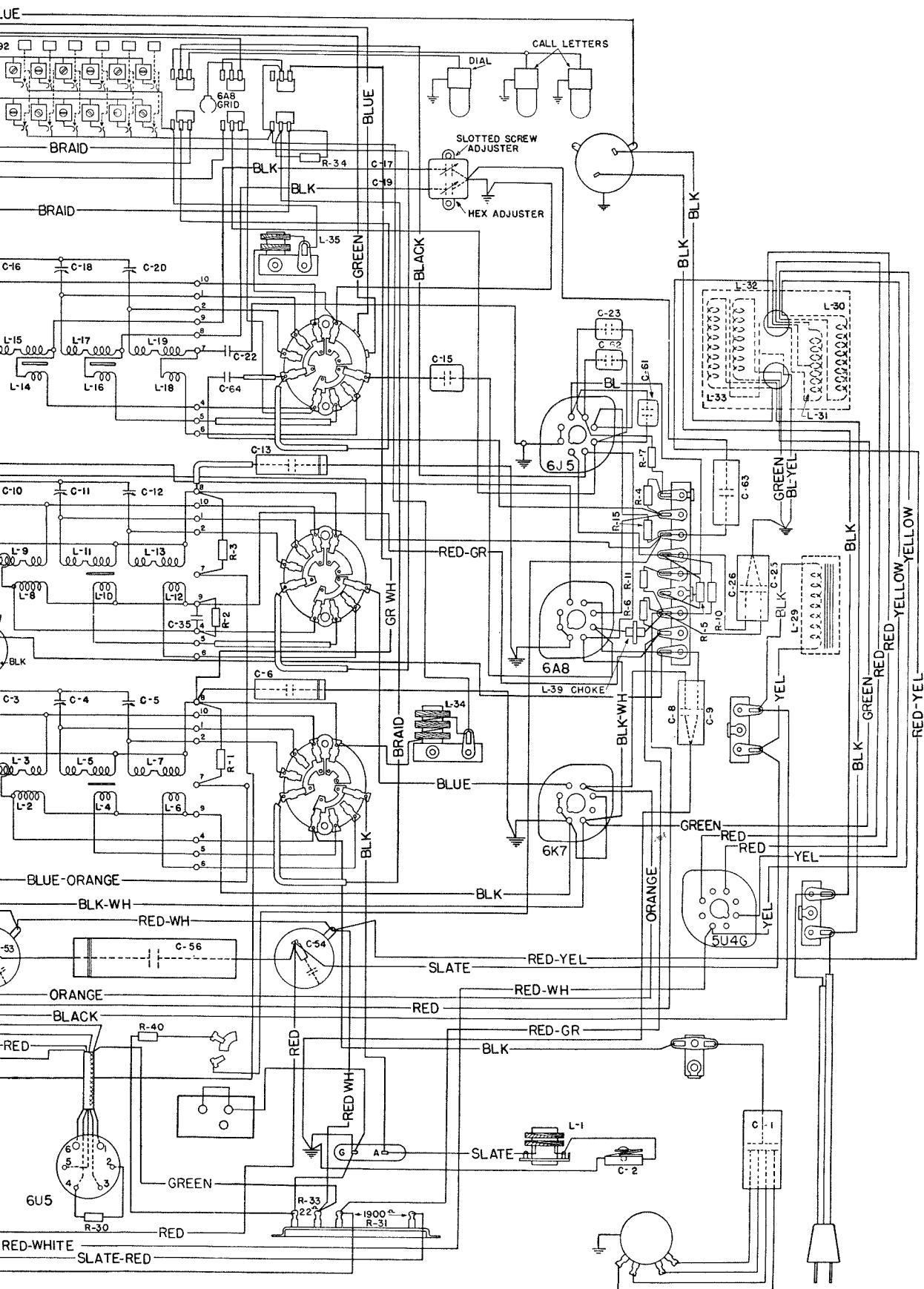


Fig. 4. Wiring Diagram, No. 2



should be set at the "Normal" position (gold pointer pointing in direction of dot).

3. Remove the lists of station letters from the P-28781 package assembly which is tacked inside of the cabinet.
4. Remove the two screws which hold the escutcheon plate to the front panel.
5. Remove from the escutcheon frame the strip of transparent material and the strip of paper on which the six stars are printed.
6. Remove the tuning indicator unit from its normal operating position.

**IMPORTANT:** Always use the tuning indicator unit when setting up stations for electric tuning, in order to determine when resonance with the desired station is obtained.

7. From the lists of stations, remove the call letters of the six stations which it is desired to set up for electric tuning. These six stations should preferably be selected and set-up in the daytime so that the best service will be obtained at all times.

**CAUTION:** Each button adjustment for electric tuning has assigned frequency limits. These limits are designated for each adjustment on the rear plate which covers the tuning adjustments and are visible when looking at the rear of the receiver. See Fig. 5. The six stations should be selected so that the frequency of each station will be within the frequency limits assigned to one of the buttons.

It will be noted that the station letters are printed on partly cut squares to facilitate ease in removing the desired station letters. In setting up these six favorite stations, the following order should be followed: Looking at the front of the receiver, the call letters of the station having the highest frequency should appear in the farthest left-hand square of the escutcheon frame, and then in successive order according to frequency the call letters of the remaining stations should be inserted into the other frames; the call letters of the station having the lowest frequency being inserted in the farthest right-hand square of the escutcheon frame. After the six station call letters have been inserted into the escutcheon frame the transparent strip should be replaced over the station call letters, and the escutcheon plate then fastened into position by means of the two screws. The tuning adjustments for the six favorite stations can now be made starting with the station having the highest frequency and proceeding as follows:

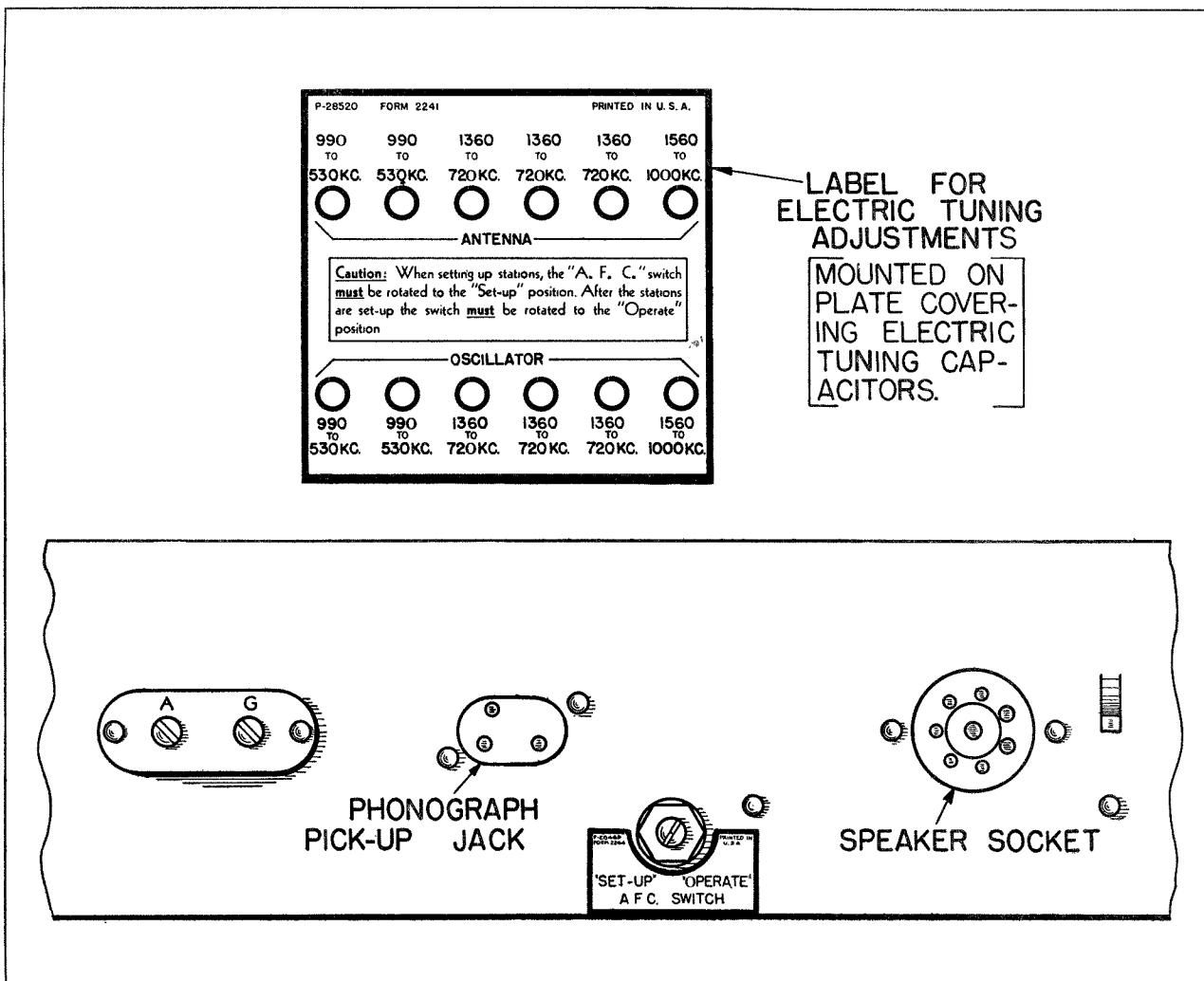


Fig. 5.

8. **IMPORTANT:** By the aid of a screwdriver, rotate the slotted shaft of the "A. F. C." switch, which is located on the rear of the chassis base, so that the slotted shaft points in the direction of the word, "Set-up" (maximum clockwise rotation). See Fig. 5.
9. Rotate the knob marked "Manual-Electric" (located on the front panel of the receiver) so that the arrow points in the direction of the word "Manual" and tune the receiver in the conventional manner by means of the station selector knobs to the station having the highest frequency and note carefully the program which it is broadcasting: Then rotate the knob marked "Manual-Electric" so that the arrow points in the direction of the word "Electric."
10. Push the farthest left-hand button (looking at the front of the receiver) which should be the button for the station having the highest frequency provided the frequency of the station is within the designated frequency limits of the tuning adjustments for this button. See Fig. 5. Then, looking at the rear of the receiver, rotate the screw of the oscillator tuning adjustment which is designated 1560 to 1000 kilocycles to the position where the desired station is received. In order to check whether the program being received is from the desired station, simply rotate the "Manual-Electric" control to the "Manual" position, and with the receiver tuned in "Manually" to the desired station a quick check can be made; then rotate the "Manual-Electric" control knob back to the "Electric" position. **Exact resonance with the desired station should be obtained by observing the tuning indicator.** When this adjustment has properly been made, the screw of the antenna tuning adjustment designated 1560 to 1000 kilocycles should be rotated to the position where maximum indication is again obtained on the tuning indicator tube. When these adjustments have been properly made the station having the highest frequency is correctly set-up for Electric Tuning by means of the push button.
11. Now proceed to set-up the remaining five stations in the same manner as mentioned in Paragraphs, 9 and 10 above, proceeding according to the frequency of the remaining stations.
12. **IMPORTANT:** When all of the adjustments have properly been made for the six desired stations, the slotted shaft of the "A. F. C." switch, located on the rear of the chassis base, should be rotated so that the slotted shaft points in the direction of the word, "Operate" (maximum counter-clockwise rotation).  
With the electric tuning system in operation, the receiver will be automatically kept in tune with any one of the six favorite stations as long as the station is operating or provided it has no unusual fading characteristics. If a distant station which is very weak is set up in the electric tuning unit, it will be found that the automatic frequency control circuit will not hold this station if a strong signal is present in either adjacent channel. This same phenomenon will occur if two stations in adjacent channels are almost of equal signal strength with the weakest signal fading slightly; with this condition the strong signal will have a tendency to "pull in" when the receiver is tuned to the station which is slightly weaker and fading.
13. The tuning indicator unit should now be replaced in its proper operating position. Before placing this unit in its proper location, make sure that the tuning indicator tube is fully inserted into its accompanying socket.

## REPLACEMENT PARTS

Piece Number	Schematic Circuit Designation	Part
18704	<b>R35</b>	Resistor, Type "B", 15,000 Ohms
22775	<b>C43, C56</b>	Capacitor, .4 Mfd.
23517	.	Tube Socket, 7 Prong
24268	.	Cord, Power Supply
24405	<b>C6, C13, C28, C36, C39, C45, C46, C63</b>	Capacitor, .04 Mfd.
24559	<b>C67, C68</b>	Capacitor, Type "O", 100 Mmfd.
25149	<b>C38, C48</b>	Capacitor, .01 Mfd.
25481	<b>C55</b>	Capacitor, .002 Mfd.
25487	<b>C15, C61</b>	Capacitor, Type "W", .001 Mfd.
25498	<b>C57, C58</b>	Electrolytic Capacitor, 10 Mfd., 25 Volts, and 10 Mfd., 25 Volts
25504	<b>C49, C59</b>	Capacitor, Type "2", 100 Mmfd.
25526	<b>R29</b>	Resistor, Type "F", 15,000 Ohms
25539	.	Tube Socket, 8 Prong
25814	<b>L39</b>	R. F. Choke Coil
26151	<b>C47</b>	Capacitor, .005 Mfd.
26260	<b>L29</b>	Choke Assembly
26287	.	Pilot Lamp
26322	<b>R28, R40</b>	Resistor, Type "E", 120 Ohms
26328	<b>R27</b>	Resistor, Type "E", 390 Ohms
26333	<b>R8</b>	Resistor, Type "E", 1000 Ohms
26345	<b>R6,</b>	Resistor, Type "E", 10,000 Ohms
26349	<b>R11</b>	Resistor, Type "E", 22,000 Ohms
26353	<b>R2, R4, R9, R13, R24</b>	Resistor, Type "E", 47,000 Ohms
26357	<b>R1, R3, R7, R12, R22, R26, R44</b>	Resistor, Type "E", .1 Megohm
26362	<b>R10, R18, R25, R38, R39</b>	Resistor, Type "E", .27 Megohm
26365	<b>R15, R21, R23, R37, R43</b>	Resistor, Type "E", .47 Megohm
26369	<b>R16, R30, R41</b>	Resistor, Type "E", 1 Megohm
26373	<b>R34, R42</b>	Resistor, Type "E", 2.2 Megohms
26497	.	Tuning Indicator Cable Assembly
26564	<b>C17, C19</b>	Capacitor, Oscillator Low Frequency Aligners
26678	.	Socket, Phono-Jack
26775	<b>R19</b>	Resistor, Type "F", 20,000 Ohms
27073	<b>C27, C31, C32, C42, C60</b>	Capacitor, Fixed Tuning, 100 Mmfd.
27081	<b>C2</b>	Capacitor Aligning
27101	<b>C35</b>	Capacitor, Type "O", 200 Mmfd.
27102	.	Pulley Assembly
27108	<b>C8, C9, C25, C26, C29, C30, C33, C34, C40, C41</b>	Capacitor, Two, .05 Mfd., 400 Volts
27110	.	Spring
27123	<b>C51</b>	Electrolytic Capacitor, 16 Mfd., 300 Volts
27125	<b>R32</b>	Resistor, Type "F", 25,000 Ohms
27134	<b>L27, L28</b>	Output Transformer
27141	.	Dial Hub Plate
27143	<b>C3, C4, C5, C10, C11, C12, C16, C18, C20</b>	H. F. Aligners for Antenna, R. F. and Oscillator Transformers
27148	<b>L1</b>	Coil Assembly, Wave Trap
27159	.	Belt
27189	<b>L30, L31, L32, L33</b>	Power Transformer (50 to 60 Cycles Chassis)
27190	<b>L30, L81, L32, L83</b>	Power Transformer (25 to 60 Cycles Chassis)
27196	.	Range Switch Assembly
27236	.	Mask Assembly (Selectorlite Dial)
27237	.	Arm Assembly (Mask Actuator)
27238	.	Rod, Mask (Actuator)
27239	.	Dial (Tuning)
27264	<b>L2, L3, L4, L5, L6, L7</b>	Coil Assembly, Antenna Transformer
27265	<b>L8, L9, L10, L11, L12, L13</b>	Coil Assembly, R. F. Transformer
27266	<b>L14, L15, L16, L17, L18, L19</b>	Coil Assembly, Oscillator Transformer
27305	<b>C46, C66</b>	Capacitor, Type "O", 50 Mmfd.
27313	.	Switch for Fidelity Control
27314	<b>L20, L21, L22</b>	First I. F. Transformer
27332	.	Indicator, Frame Assembly
27336	<b>C53</b>	Electrolytic Capacitor, 16 Mfd., 500 Volts
27337	<b>C65</b>	Capacitor, Type "W", .004 Mfd.
27339	.	Switch, "Off-On-Bass" (Used on Radio Models only)
27341	<b>R20</b>	Resistor, Flexible 200 Ohms
27374	<b>R31, R33</b>	Resistor, "B" Voltage Divider
27407	<b>R36</b>	Resistor, Type "EB", 22,000 Ohms
27411	.	Clamp Assembly, Tuning Indicator
27493	<b>C1</b>	Capacitor Assembly; Four, .002 Mfd.
27537	<b>C24, C50, C52</b>	Electrolytic Capacitor, 4 Mfd., 400 Volts; 4 Mfd., 250 Volts; 4 Mfd., 250 Volts
27538	<b>C22</b>	Capacitor, Type "W", .005 Mfd.
27540	.	Switch, Signal Admission Control
27569	<b>R14</b>	Volume Control
27577	<b>C37</b>	Capacitor, Type "O", 15 Mmfd.
27622	<b>C54</b>	Electrolytic Capacitor, 16 Mfd., 500 Volts
27646	<b>C44</b>	Capacitor, .002 Mfd.
28488	<b>C7, C14, C21</b>	Gang Tuning Capacitors
28492	.	Adjustable Capacitors and Switches Assembly for Electric Tuning
28522	.	Electric Tuning Cable Assembly
28523	.	Electric Tuning Cable Assembly
28549	<b>L34</b>	Antenna Coil for "Electric" Tuning
28550	<b>L35</b>	Oscillator Coil for "Electric" Tuning

28555	<b>L36, L37, L38</b>	.	.	.	.	.	<b>Discriminator Transformer</b>
28565	<b>R17</b>	.	.	.	.	.	<b>Resistor, Type "R", 630 Ohms</b>
28567	<b>C62</b>	.	.	.	.	.	<b>Capacitor, Type "O", 60 Mmfd.</b>
28568	<b>C28</b>	.	.	.	.	.	<b>Capacitor, Type "O", 100 Mmfd.</b>
28572	.	.	.	.	.	.	<b>Drive Assembly</b>
28605	<b>L23, L24</b>	.	.	.	.	.	<b>Second I. F. Transformer</b>
28616	.	.	.	.	.	.	<b>A. F. C. Switch</b>
28653	.	.	.	.	.	.	<b>Shuttle Switch for "Manual-Electric" Tuning Capacitors</b>
28693	<b>R5</b>	.	.	.	.	.	<b>Resistor, Type "E", 2700 Ohms</b>
28699	.	.	.	.	.	.	<b>Pilot Lamp Socket Assembly for Tuning Dial</b>
28700	.	.	.	.	.	.	<b>Pilot Lamp Socket Assembly for Station Call Letters</b>
28702	.	.	.	.	.	.	<b>Lever Assembly for "Manual-Electric" Control Switch</b>
28704	.	.	.	.	.	.	<b>Drive Rod for "Manual-Electric" Control Switch</b>
28705	.	.	.	.	.	.	<b>Button for "Manual-Electric" Control Switch</b>
28711	.	.	.	.	.	.	<b>Cam and Bracket Assembly for "Manual-Electric" Control</b>
28720	.	.	.	.	.	.	<b>Spring for "Manual-Electric" Control Switch</b>

### Used only on No. 245-P Receivers

25301	.	.	.	.	.	.	<b>Cord, Power Supply for Phono Motor</b>
26751	.	.	.	.	.	.	<b>"Off-On-Bass-Phono" Switch</b>
27947	.	.	.	.	.	.	<b>Shielded Cord Assembly</b>
28118	.	.	.	.	.	.	<b>Pilot Lamp Socket Assembly</b>

### MISCELLANEOUS PARTS

Piece Number							Part
27800	.	.	.	.	.	.	<b>Knob Assembly (Used on "Volume", "Range Switch" and "Off-On-Bass" Controls' Shafts)</b>
27801	.	.	.	.	.	.	<b>Knob Assembly (For "Fidelity" Shaft)</b>
27802	.	.	.	.	.	.	<b>Knob Assembly (For "Rapid Station Selector" Control Shaft)</b>
27803	.	.	.	.	.	.	<b>Knob Assembly (For "Vernier Station Selector" Control Shaft)</b>
27628	.	.	.	.	.	.	<b>Felt Washer (Used on "Volume", "Fidelity", "Range Switch" and "Off-On-Bass" Controls' Shafts)</b>
27630	.	.	.	.	.	.	<b>Felt Washer (For "Rapid Station Selector" Control Shaft)</b>
28504	.	.	.	.	.	.	<b>Knob (For Stations' Selectors of Electric Tuning)</b>
28603	.	.	.	.	.	.	<b>Knob (For "Manual-Electric" Control)</b>